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# Locally Advanced Rectal Cancer With a Pelvic Kidney Complicating Adjuvant Radiation Therapy

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The simultaneous occurrence of colorectal malignancy with pelvic kidney is unusual. We report a case of locally advanced rectal cancer stage III disease, T3N2M0, with a pelvic kidney complicating adjuvant radiation therapy. We recommend preoperative evaluation of the pelvic kidney to allow for its protection by translocation or heterotopic autologous transplantation. Occasionally a nephrectomy may be necessary. Otherwise extended lymph node dissection is not performed; hence, adequate treatment of the primary rectal cancer is compromised. The sequela of inadequate surgical excision and suboptimal radiation therapy is early relapse.



KEY WORDS: ectopic kidney, rectal carcinoma, adjuvant radiation therapy

## INTRODUCTION

Pelvic kidney is an ectopic renal mass opposite the sacrum and below the aortic bifurcation (Fig. 1). The incidence has been estimated to be 1 in 2,100–3,000 autopsies. Solitary ectopic kidney occur once in 22,000 autopsies [1]. Cervical cancer complicated by a pelvic kidney has been reported [2]. Our review of the literature revealed no previous reports of rectal cancer and pelvic kidney. It is estimated that there will be 39,000 new cases of rectal cancer in 1996 and 8,500 deaths [3]. Studies show that 58% of patients present with locoregional disease. Those with nodal involvement can expect a 20% survival advantage by adequate adjuvant radiation therapy and chemotherapy. This paper illustrates the anatomical, functional, radiological, and clinical characteristics of pelvic kidney and discusses the importance of preoperative diagnosis and planning to maximize curative resection of simultaneously occurring rectal cancer.

## CASE REPORT

A 63-year-old man presented with a 3 month history of rectal bleeding. Past medical history is negative for hypertension or urinary tract infections. The patient had previous episodes of nephrolithiasis that required no intervention. Preoperative workup showed normal chest x-ray, normal liver function tests and serum creatinine 0.9 mg/dl (0.6–1.2 mg/dl). No preoperative computed tomography (CT) scan was done. Endoscopic examination showed villous adenoma with dysplasia at 8 cm from the anal verge. At celiotomy a right pelvic kidney was discovered below the aortic bifurcation opposite the right common iliac vessels (Fig. 1). The rectal cancer appeared localized to the rectum. A low anterior resection with colorectal anastomosis was performed; however, no attempt was made to relocate the kidney or extend the lymph node dissection. Pathological examination showed a poorly differentiated adenocarcinoma with extension into perirectal tissue. Thirteen of 16 regional lymph nodes were involved. The disease was stage III T3N2M0. The patient was referred to our institution for further management. His options included (1) re-exploration with extended lymph node dissection, small bowel exclusion from the pelvis with relocation of the pelvic kidney, heterotopic transplantation if technically feasible or possibly a nephrectomy; or (2) no further surgical intervention

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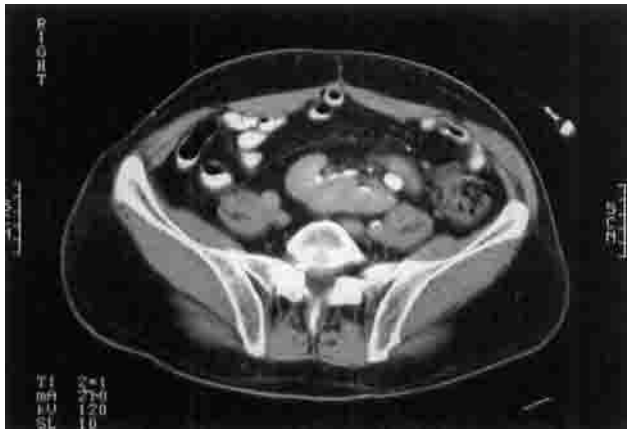

Fig. 1. CT demonstration of right pelvic kidney situated against the right common iliac vessels.

Fig. 2. Postoperative CT scan at 8 months suggestive of local failure.

but adjuvant chemotherapy and radiation therapy with or without shielding of pelvic kidney. The patient opted for shielded radiation therapy and chemotherapy. He received 50 Gy over $5\frac{1}{2}$ weeks with shielding of his pelvic kidney. In addition, he received bolus 5-fluorouracil (5-FU) and levamisole. However, 8 months postoperatively a repeat CT scan showed multiple bilobar liver metastasis and pelvic disease suggestive of local failure (Fig. 2). His chemotherapy regimen was changed to bolus 5-FU and leucovorin. The patient is currently alive at twelve months postoperatively.

## DISCUSSION

The simultaneous occurrence of rectal cancer and a pelvic kidney is rare. The pelvic kidney has an aberrant blood supply and a congenitally short slightly tortuous ureter. Left ectopia is more common than right. The ectopic kidney is slightly more susceptible to hydronephrosis or urinary calculus formation due to its malrotation and anteriorly placed pelvis [1]. Dretler et al. [4] reviewed 86 cases of pelvic kidneys. Seventeen kidneys out of 33 had a solitary renal artery arising at, or just distal to, the aortic bifurcation; 12 kidneys had a dual arterial supply from the aorta and one from the ipsilateral or contralateral common iliac artery. Three kidneys had a triple blood supply (aorta, common iliac, internal iliac), and one kidney was supplied by four vessels. The arteries entered the kidney anteriorly but occasionally entered posteriorly. Venous drainage was to the common iliac vein or to vena cava, or both.

Radiation-induced renal damage was first noticed following abdominal baths for treatment of testicular tumors [5]. A demonstrable decrease in renal function was shown after fractioned renal dose of 10–20 Gy. Renal irradiation to 23 Gy over a 5-week period is associated with a 5% risk of renal failure at 5 years; the rate increases to 50% after 28 Gy [6]. Dewit et al. [7] showed a 30–40% decrease in renal function, as assessed by scintigraphy after 3–5 years of administration of 40 Gy in $5\frac{1}{2}$ weeks. Radiation nephropathy is a slowly progressive, noninflammatory disease with a wide clinical and histological spectrum, depending on total dose, fractionation schedule, age of the patient, and comorbid factors. The earliest histological changes are tubular atrophy, followed by more severe tubular loss, interstitial fibrosis, and hyalinization of some glomeruli. Eventually marked media and intimal thickening of larger arteries occur [8]. Acute radiation nephritis syndrome of hypertension, edema, proteinuria, and uremia can develop 6–13 months following renal exposure in excess of 23 Gy in about one-half of patients. Complete recovery is unusual. Chronic radiation nephritis develops over months to years, eventually leading to death from renal failure or left ventricular failure. Mild asymptomatic proteinuria can develop years after radiation therapy and may precipitate renal failure after moderate stress. Malignant hypertension may appear 2–11 years after irradiation and usually respond well to nephrectomy [9,10]. Radiation-induced nephropathy can be further exacerbated by non-nephrotoxic chemotherapeutic agents.

Pelvic irradiation is a common treatment modality for colorectal cancer. Early stage rectal cancer stage I disease (T1–2N0M0) is associated with a 5-year survival of 80%–90% with surgery alone. The risk of local failure is less than 10%. However, patients with stage II (T3–4N0M0) and stage III (T1–4N1–3M0) have a 15–65% risk of locoregional failure and benefit from adjuvant therapy. Locoregional failure accounts for almost 50% of all recurrences [11]. Multiple studies have shown a decreased risk of local failure and improved disease-free and overall survival with postoperative radiation therapy and chemotherapy for T3–4N0–2M0 disease [12]. Doses of greater than 50 Gy plus 5-FU chemotherapy are required to achieve an acceptable low risk of locoregional failure within the range of 15–20%. The anterioposterior (AP:PA) radiation field should extend 1–1.5 cm above

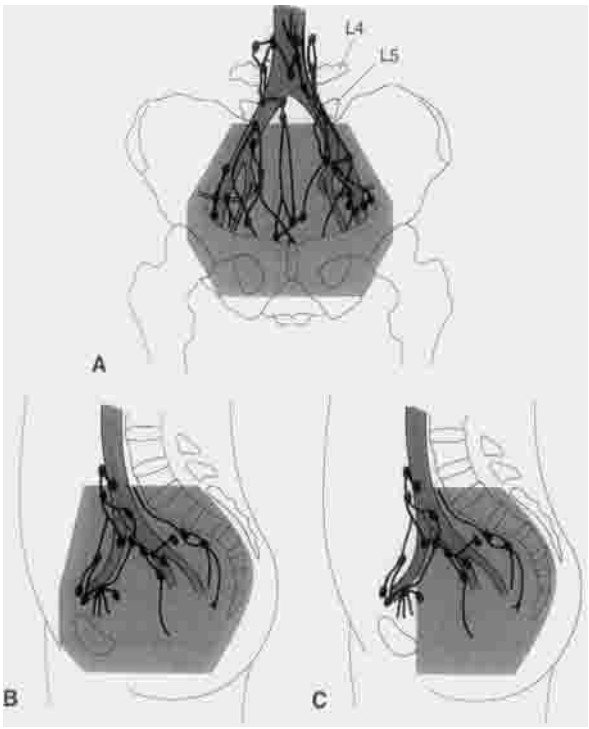


Fig. 3. **A:** Radiation field extending to L5–S1 for colorectal cancer treated by low anterior resection. Inferior margin includes obturator foramen. **B:** Lateral fields with inclusion of external iliac nodes, internal iliac nodes, and presacral nodes. **C:** Lateral fields with inclusion of internal iliac nodes and presacral nodes.

the sacral promontory and inferiorly include the obturator foramen (Fig. 3). Local failure is most common in the sacral hallow, hence utilization of the lateral field to deliver adequate dosage with minimal risk to the small bowel. Blocks are used to shield surrounding soft tissues. In the absence of pelvic organs involvement, a typical field would include lymph nodes along the common iliac, internal iliac arteries, and presacral nodes. A pelvic kidney will be exposed unless shielded during radiation therapy. Only 5% of the radiation delivered passes through the shielding block well below the calculated renal tolerance dose of 20 Gy in 3 weeks [7]. However, such shielding will prevent delivery of adequate radiation therapy to lymph nodes along the right common and internal iliac vessels.

Complete mesorectal excision (MSE) by sharp dissection along the parietal pelvic fascia and medial to internal iliac vessels has been advocated by Heald [13] and Enker [14]. Total local recurrence rate as low as 3.5% without adjuvant radiation therapy was reported by Heald. Standardized use of MSE might lead to modifications in the requirement of adjuvant radiation therapy. An immobilized pelvic kidney complicates complete lymph node dissection. Preoperative identification of a pelvic kidney by CT and evaluation of renal function enables both the surgeon and the patient to make informed decisions regarding surgical options and adjuvant therapy. Renal nuclear scans are useful. If the pelvic kidney has minimal function, a nephrectomy may be performed during the rectal cancer operation. If the pelvic kidney function is normal, an arteriogram is recommended, especially in solitary ectopic kidney, to evaluate the vascular supply for possible relocation. The vascular pedicle of the pelvic kidney will require dissection to its origin, and the ureter might need further mobilization to gain extra length. The kidney should be transposed to the iliac fossa and sutured with the parietal peritoneum to the psoas muscle [2]. Heterotopic autologous transplantation to either flank is possible; however, it can be complicated by aberrant blood supply and a short ureter. Occasionally, a nephrectomy may be necessary, regardless of pelvic kidney function, as long as the contralateral kidney is normal.

Adjuvant pelvic irradiation is recommended for stage II and III rectal disease. Preoperative CT scan is useful. When confronted by the unusual occurrence of rectal cancer and pelvic kidney, we recommend protecting the pelvic kidney by translocation or by performing heterotopic autologous transplantation prior to pelvic irradiation. Failure to do so will compromise adequate surgical treatment and expose the patient to the risks of radiation-induced nephropathy and its sequelae, including deteriorating renal function and malignant hypertension. In the case presented, we suggest that preoperative identification and planning coupled with appropriate dissection and nodal clearance with relocation of the pelvic kidney might have lead to better local and systemic control.

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